

(5) *FURNARIUS TRICOLOR*, Döring; Cab. J. f. O. 1878, p. 196.

This little species, which is quite new to me, is even rather smaller than *F. minor*, Pelzeln, and quite different in colour.

(6) *SYNALLAXIS ORBIGNII* (Reichenb.); ScI. P. Z. S. 1874, p. 22.

Dr. Döring's skin is marked "*S. fugax*, sp. nov.," but agrees well with one in my collection (ex Mendoza, *S. crassirostris*, Landbeck) which I refer to *S. orbignii* (Reichenb.).

(7) *SYNALLAXIS SCLATERI*, Döring; Cab. J. f. O. 1878, p. 196.

This species, which Dr. Döring has done me the honour to call after me, is certainly very nearly allied to my *S. hudsoni* (P. Z. S. 1874, p. 25), and may be the same. Unfortunately I have mislaid the typical specimen of *S. hudsoni*, and cannot make the necessary comparison. There is a faint tinge of yellow on the throat of *S. sclateri*; this was certainly well marked in my *S. hudsoni*.

(8) *PHACELLODOMUS SIBILATRIX*, Döring, MS.

I have already a Bolivian example of this species in my collection, but had confounded it with *P. frontalis*, as likewise Lafresnaye and D'Orbigny seem to have done. It appears distinguishable from *P. frontalis* by the rufous colour on the bend of the wing.

(9) *NOTHOPROCTA DOERINGI*, Cab. J. f. Orn. 1878, p. 198.

This species is closely allied to *N. pentlandi* (Gray), of Bolivia, and to *N. punctulata* (Gray), of Chili. Specimens of all three species are in the Paris Museum.

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The following papers were read :—

1. A Description of the Vessels of the Neck and Head in the Ground-Hornbill (*Bucorvus abyssinicus*). By W. OTTLEY, F.R.C.S., Demonstrator of Anatomy at Univ. Coll. Lond.

[Received May 17, 1879.]

In a paper read before this Society in 1876 (see P. Z. S. 1876, p. 60), Mr. Garrod drew attention to a peculiarity in the vessels of the neck of the Ground-Hornbill, and pointed out that the carotid arteries, instead of being found in their usual place in the middle of the neck and in the hypapophysial canal, were replaced by two vessels which accompanied the pneumogastric nerves as far as the head. This peculiarity had not been observed in any other bird, the nearest approach to it being found in some Parrots, where such a vessel is found on one side of the neck, while the carotid artery of the other has its normal position. Though at first inclined to suppose that these aberrant arteries were really carotids, Mr. Garrod felt some doubt on the point,

and was kind enough to give me an injected specimen, the arteries of which are described in this paper, in order to determine the question.

The results of this examination show that, besides the possible varieties in the arteries of the neck enumerated by Barkow in his admirable paper in Meckel's 'Archiv' for 1829, there is a further variety which he had not calculated upon.

Meckel classifies these possible varieties in the following manner :—

1. Both common carotids may run up the side of the neck. (Not yet observed.)
2. One common carotid may be in the middle line and one on the side of the neck.
  - a. The left superficial.
  - b. The right superficial. (Not yet found.)
3. Both may be in the middle line.
  - a. The left covering the right. (Usual.)
  - b. The right covering the left.
4. They may unite in the middle line and divide again above.
  - a. Both equal in size. (As in the Common Bittern.)
  - b. Left may be smaller. (As in *Phœnicopterus*, observed by Garrod.)
  - c. Right may be smaller. (As in *Cacatua sulphurea*, observed by Meckel.)

The variety which is met with in *Bucorvus*, however, is of a different nature. Here there are two superficial arteries accompanying the pneumogastric nerves, and they end above by anastomosing with the vertebral arteries. But they are not carotid arteries; for there remain two fine cords, the obliterated common carotids, which are attached below to the vertebral arteries, and which run inwards to the middle line and continue up the neck in the hypapophysial canal, covered over by fascia, but in no place by a bony arch. Opposite the body of the fourth cervical vertebra both these fine cords leave the canal, and, bending outwards beneath the œsophagus, end by joining the vertebral arteries again very soon after these have turned forwards, when they have escaped from their bony canal, and just beyond the point where the internal carotid arteries are given off.

The superficial arteries are then the enlarged representatives of the anastomosing ascending and descending cervical arteries, which usually are branches of the common carotid and superior thyroid arteries respectively; and their relatively large size is to be accounted for by the obliteration of the common carotids.

As a result of this arrangement of the vessels of the neck, the origin of the arteries for the supply of the head differs from that usually met with; and the second drawing shows the course of these vessels, which hardly differed from one another on the two sides, except as regards the size of one or two of the trunks.

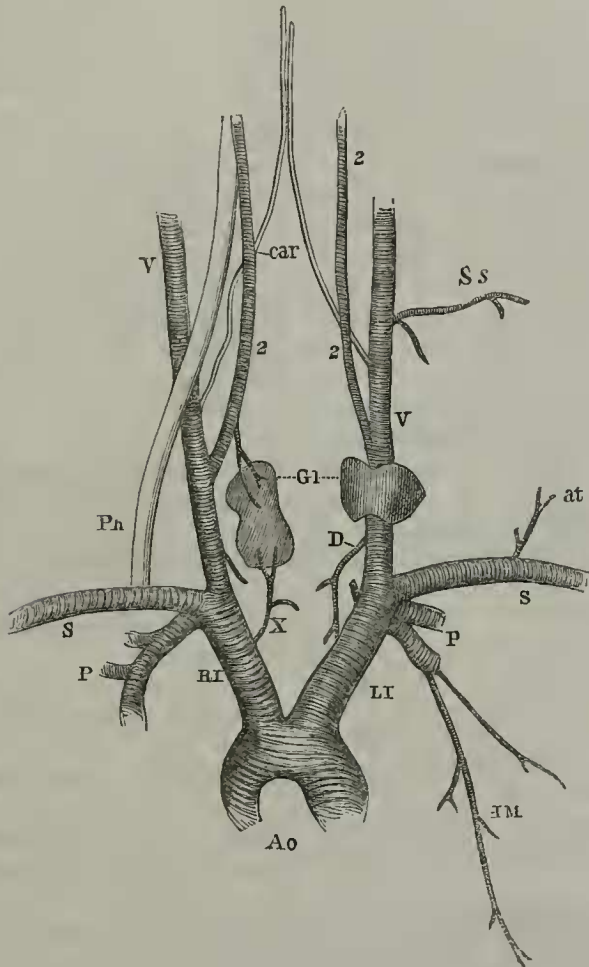
#### *Description of the Vessels.*

The innominate arteries are given off from the aorta as usual; and after a short course upwards, across the bronchi, both arteries break

up into numerous branches, which closely resemble one another on the two sides. In the plan (fig. 1) certain vessels are drawn on one side, others on the other, for the sake of greater distinctness.

The first branch given off, P, is the large artery to the *pectoralis primus*, from which comes off an internal mammary, IM., and

Fig. 1.



Plan of the innominate arteries and their branches.

another small vessel to the sternum. Opposite the same point the innominate gives off a branch X, which supplies the gland lying on the vertebral artery and anastomoses in its substance with a branch

from the *comes nervi vagi*, 2, and which also furnishes several branches to the syrinx and its muscles. And, lastly, the innominate divides into subclavian and vertebral. From the former, S, only one branch, the acromial thoracic, *at*, is seen to spring, before the artery escapes from the thorax. The latter, V, soon sends a branch downwards, D, which runs with the recurrent laryngeal nerve, and ends by supplying the bronchus, the lung-substance, and the œsophagus. The next branch, 2, is the *comes nervi vagi*, which runs up the neck with the vagus nerve, and ends by anastomosing with the vertebral. In its course it supplies:—(a) a branch to the thyroid gland, *Gl*; (b) a series of vessels forwards to the œsophagus, where they form loops and supply several branches to the trachea as well as to the skin; (c) near the head a small offset to the internal pterygoid muscle. After this the vertebral gives off a suprascapular artery, *Ss*, and a superior intercostal (which from its lying behind the vertebral cannot be represented) to the upper three spaces; and between these two and the branch 2 a white thin cord springs from the inside of the vertebral, and, crossing, inwards beneath the *comes nervi vagi*, gets beneath the œsophagus to the hypapophysial canal. Here it is joined by its companion of the opposite side; and these cords run up the neck side by side till near the fourth cervical vertebra, when they bend outwards, get from beneath the pharynx, and end by joining the vertebral trunk (as seen in the second plan of vessels), just after this artery has sent off that branch which furnishes the internal carotid.

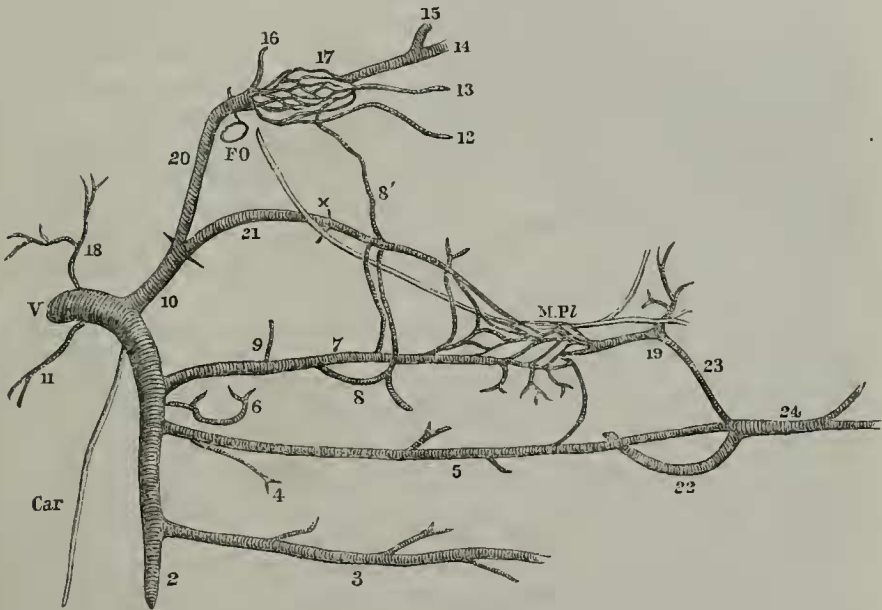
It thus appears that the two true carotids are obliterated, while their duty is performed by a superficial vessel on each side, which, accompanying the vagus as it does, might be called the *comes nervi vagi*, though by its position in the neck this vessel rather resembles the true carotid of Mammalia. These vessels did not differ much in size; the right was somewhat larger; but the vertebrales were almost precisely symmetrical.

As a result of this change in the vascular supply of the neck, the arrangement of the vessels in the upper part of the neck and in the head was a good deal modified. In the place of an anastomosis between the vertebral and an occipital branch of the carotid, the vertebral, which is large, turns forward and completes an arch with the superficial *comes nervi vagi*, whose concavity is joined by the obliterated carotid, while its convexity furnishes the branches for the head.

The following is a short description of their course and distribution (*vide* fig. 2, p. 465). After the vertebral artery has turned forwards out of the canal in the cervical transverse processes, its first branch (18) is distributed to the muscles attached to the back of the head. Another small branch (11) is given downwards to reach the digastric and internal pterygoid. A large vessel (10) then comes off, which soon enters a bony canal behind the tympanum (the limits of which are marked by the transverse lines in the plan), and divides into two (20, 21); the upper vessel (20) turns behind the fenestra ovalis (F O), and, then emerging from its canal, furnishes a large offset to the orbital plexus:

it is continued through this plexus and divides almost immediately into two branches (14, 15), both of which supply the contents of the orbit, and eventually anastomose with the ethmoidal artery; 14 runs near the roof of the orbit, 15 under the optic nerve; 16 runs near the roof of the orbit, 15 under the optic nerve; 17 furnishes two small branches (12, 13) to the eyelids and the muscles of the eye, a vessel (16) which runs in front of the quadrate bone, and ends in the muscles attached to the mandible, and a descending branch (8'), the course of which will be presently described.

Fig. 2.



Plan of the arteries for the supply of the head and neck. Right side.

The vessel 21 is the internal carotid; opposite the mark *x* a large offset is sent to the maxillary plexus (M.Pl.), which is joined on its way by a communication from the internal maxillary artery (7). After giving off this large branch the internal carotid continues its tortuous course through a special bony canal till it reaches the interior of the cranium. A small nerve (a branch of the facial) crosses the internal carotid artery on its outer side where the communicating offset leaves that vessel.

The next branch of the vertebral is the internal maxillary (7), a large vessel which runs above the internal pterygoid muscle. Its first branch (9) ends in muscular offsets.

The next (8) emerges from behind the triangular tendon of the external pterygoid, is joined by a communication from the orbital

plexus (8'), and, accompanying the inferior dental nerve, ends in the mandible. After this the internal maxillary artery breaks up into the maxillary plexus, which furnishes many branches to the internal pterygoid and to the muscle which depresses the upper jaw. The plexus is joined by a branch from the palatine artery (5), and furnishes a large offset (19), which is partly distributed to the olfactory mucous membrane, partly (23) ends by anastomosing with the common trunk formed by the union of the palatine arteries.

The next branch of the vertebral (6) is a small vessel which supplies the internal pterygoid, and, turning across the spine behind the pharynx, ends by joining its fellow of the opposite side.

The next (5), the palatine artery, furnishes branches to the internal pterygoid, and runs along the lower surface of that muscle. In front it meets and joins its fellow, the left being considerably the larger. The common trunk thus formed is joined by an offset from each maxillary plexus, and soon breaks up into larger branches; it is distributed to the lower surface and the interior of the beak.

The last branch of the vertebral, before it joins the *comes nervi vagi*, is the lingual artery (3). This supplies the muscles above the hyoid bone, and the mucous membrane of the mouth; it joins its fellow at the symphysis, and ends in the substance of the mandible.

The obliterated carotid (*car*) is seen joining the vertebral, close to the origin of the branch 10.

After the internal carotid (21) has given off its branch to the maxillary plexus, it runs along its canal to enter the skull on the side of the *sella turcica* (*vide* fig. 3, p. 467); it at once sends a branch backwards (25), which probably anastomoses with that of the other side. This vessel, the only representative of a basilar artery, runs backwards in a groove on the upper surface of the basisphenoid, supplying the medulla; the artery on the right side is considerably larger than that on the left. The next large branches are distributed on the outer surface of the optic lobes and the hemispheres; and finally the artery divides into the middle cerebral (28) and the ethmoidal (26). The latter soon enters the orbit, where it has been already described as anastomosing with branches 14 and 15. It helps to supply the olfactory mucous membrane, and gives offsets to the bony expansion on the top of the head and the skin in front of the eye (29).

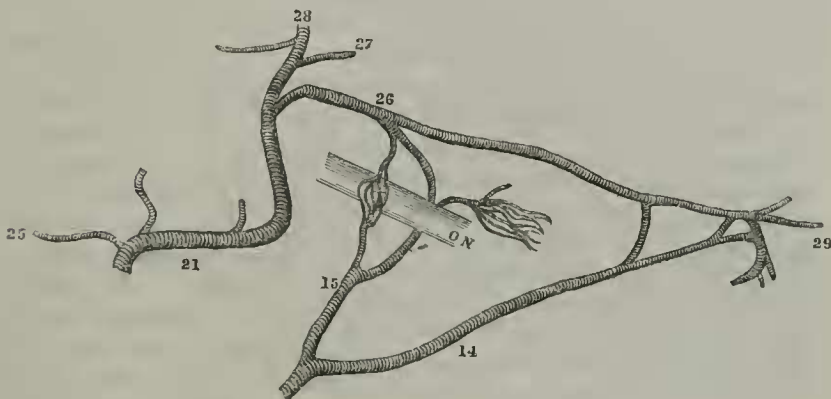
The principal differences between the arteries of the head in *Bucorvus* and those of birds generally are therefore:—1st, the absence of any considerable superior thyroid artery; this vessel is replaced by branches from the *comes nervi vagi*. 2nd, the absence of any artery which could be called facial. Its place is taken by branches from the maxillary plexus and from the ophthalmic artery. It may be added that Barkow calls that artery facial which, following Bauer's description, I have named internal maxillary; also that the artery which Barkow names ethmoidal Owen calls ophthalmic, and Bauer internal ophthalmic. In this case, and in the names given to all the other branches to the head, I have used those which were originally employed by Barkow.

I have not attempted to suggest any theory to account for the

singular fact that in this bird, and in this bird alone, so far as is at present known, such a remarkable event should occur as the complete obliteration of the principal vessels for the supply of the head.

The presence of two quite distinct vestiges of the missing arteries, in the shape of the two fine cords, which have been already described, would seem to indicate that this obliteration must have occurred after the arteries in question had been fully formed and for some

Fig. 3.



Plan of the internal carotid and its branches, with the arteries in the orbit (enlarged). Right side.

time in use. The manner in which the obliterated cord joins the vertebral artery above suggests that the vessel from which the internal carotid springs was originally a direct continuation of the common carotid trunk. And the alteration that would be necessitated by the obliteration of the main artery would be simple. The vessel which extends from 10 to the vertebral canal would then have been the occipital, which normally should anastomose with the vertebral in this position, while the part from 10 to 2 would be the external carotid, giving the usual branches. It seems probable therefore that at some time in the history of this bird the distribution of its vessels differed but little from that usually met with; but this fact perhaps adds to the difficulty of accounting for the change that has taken place. The theories hitherto proposed to account for such obliterations of the vessels of the neck in birds have only dealt with a change affecting one side of the body. This is the only instance which I am acquainted with of the symmetrical closure of two such important arteries at a period which, if I am correct in my supposition, was subsequent to their full development and functional activity.